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Sara Fazzi Garcia
sara.fazzigarcia@unh.edu

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**Improving Breastfeeding Establishment by Reducing the Use of Bottles and Artificial
Nipples with Medically Needed Supplementation in Full-Term Breastfed Infants: A
Quality Improvement Project**

Sara Fazzi Garcia MSN, RN, IBCLC

Department of Nursing, University of New Hampshire

Faculty Mentor: Pamela Kallmerten PhD, DNP, RN, CNL

Practice Mentor: April Antognoni MSN, RN, CNL & Tara Ponder BSN, RN

Date of Submission: August 7, 2022

Table of Contents

Abstract.....	4
Introduction.....	5
Problem Description	7
Available Knowledge	9
Supplementary Feedings in the Healthy Term Breastfed Neonate	9
Cup Feeding as Alternative Method	11
Artificial Nipples and their Impact to Exclusive Breastfeeding	12
Pacifier/Bottle Feeding vs. Cupfeeding.....	12
Appraisal Synthesis.....	13
Rationale	14
Specific Aim.....	15
Methods.....	16
Context.....	16
Cost-Benefit Analysis.....	16
Interventions.....	17
Study of the Intervention	18
Measures	18
Analysis	19
Ethical Considerations.....	19

Results	20
Results	20
Discussion.....	22
Summary.....	22
Key Findings.....	22
Project Strengths.....	23
Interpretation	23
Impact	24
Contextual Factors impacting the Specific Aim.....	24
Costs and Strategic Trade-Offs, including Opportunity Costs	24
Limitations.....	25
Conclusions.....	26
References	28
Appendix A	31
Appendix B	33

Abstract

Background: Breastfeeding has long been strongly recommended by national and international organizations as a prevention of many common and chronic diseases. Baby-Friendly Hospital Initiative (BFHI) was developed to motivate hospitals to protect, promote, and support breastfeeding. This Quality Improvement (QI) project aims at supporting the continuation of the Baby-Friendly designation at the organization is being implemented, by focusing on reducing the use of bottles and artificial nipples for medically necessary supplementation for full-term breastfed newborns.

Methods: The Plan-Do-Study-Act (PDSA) framework was utilized to guide this quality improvement project.

Intervention: Educational posters on the interference of the use of bottles in breastfed infants in relation to breastfeeding establishment were prepared and affixed in common areas that nursing staff frequented often to increase access and readability of the material.

Results: The project goal of a reduction of 15% use of bottles and artificial nipples was not met during this rapid change cycle; however, the collected data showed that bottles were used less by 9.5% than the pre-intervention period, and an increase of 9.5% in the use of alternative feeding methods was seen.

Conclusion: A colored chart comparison highlighted a reduction of 9.5% in the use of bottles and artificial nipples in the post-intervention period, indicating a positive effect from the educational posters was obtained in this QI project.

Keywords: breastfeeding, supplementation, bottles, artificial nipples, Baby-Friendly Hospital Initiative, alternative feeding methods.

Introduction

Breastfeeding has been supported and promoted for many decades by several organizations, such as World Health Organization (WHO), United Nations International Children's Emergency Fund (UNICEF), and the American Academy of Pediatrics (AAP) to name a few important ones. It is well known that breastmilk reduces the risk of lower respiratory tract infections in infants who are less than 6 months old, as well as the incidence and mortality of necrotizing enterocolitis in premature or low birth infants, among other important benefits (Binns et al., 2016). In more recent years, an increasing number of studies have shown a correlation between breastfeeding and protection against chronic diseases that extends across the lifetime (Binns et al., 2016). More specifically, in the article written by Binns and colleagues (2016), they report that breastfeeding plays a huge role in preventing gastritis, gastric carcinoma, dental caries, and chronic inflammation in general. The WHO reports that the major long-term benefits of breastfeeding are an association of higher performance on intelligence tests and cognitive development, a reduction of the risk of obesity in children and adults, and a reduction of the risk of developing type 2 diabetes mellitus later in life (Binns et al., 2016). Additionally, long-term benefits to breastfeeding mothers include decreased risk of developing ovarian cancer, premenopausal breast cancer, as well as decreased rates of obesity, type 2 diabetes, and heart disease (Binns et al., 2016). Binns and colleagues (2016) explain the reasons behind such great short and long-term advantages of breastfeeding, being the effects that breastmilk has on the development and maintenance of the human microbiome in our gut. Seeing the proven advantages of breastmilk, breastfeeding, or the use of it should not only be considered a lifestyle choice but also a public health matter (Eidelman et al., 2012). The AAP recently reaffirmed its recommendation to exclusively breastfeed infants for the first 6 months of life, and then continue

for a year or longer as complementary foods are introduced. According to Binns and colleagues (2016), the first 24 months of life are very essential to shaping the future health, and breastfeeding is considered a very important component.

Following the *Innocenti Declaration* in 1990, which says that all women should be allowed to exclusively breastfeed their infants up to the first 4-6 months (Innocenti Declaration-World Breastfeeding week, 2018), the WHO in collaboration with UNICEF, launched the Baby-Friendly Hospital Initiative (BFHI) in 1991. BFHI aims to motivate facilities to implement practices that protect, promote, and support breastfeeding (World Health Organization, 2018). The main purpose of this initiative is to allow those mothers and their infants to receive immediate, pertinent care during their pre- and post-partum stays to enable breastfeeding initiation (World Health Organization, 2018). BFHI is also inclusive of the care and feeding of infants who are not breastfed (World Health Organization, 2018). Baby-Friendly USA, Inc. (BFUSA), as the accrediting body and national authority for the BFHI in the United States, directs and oversees the coordination and the activities that are necessary to gain and maintain the Baby-Friendly designation (Baby-Friendly USA, 2022).

Once the Baby-Friendly designation has been conferred, the facility is still responsible to continue data collection, monitoring the implemented practices, and applying yearly quality improvements to maintain the Baby-Friendly standards, as well as adhering to the current guidelines and evaluation criteria (Baby-Friendly USA, 2022). The facility will have to be re-evaluated every 5 years to maintain the official designation (Baby-Friendly USA, 2022).

The guidelines and evaluation criteria (GEC) are updated periodically; it is therefore recommended the facility is remaining current with them to facilitate the re-designation process. The GEC is comprised of several steps including policy, education to staff and pregnant women,

support, and counsel post-delivery and post-discharge. The organization should write and regularly circulate to all staff a breastfeeding policy in line with the GEC set by Baby-Friendly USA. Breastfeeding education of 20 hours, of which 5 are supervised clinical experience, should be provided upon 6 months from hire for all maternity staff; all pregnant women should receive relevant lactating education as well as help initiating breastfeeding within the first hour from birth. All nursing staff in a maternity unit should be able to provide post-delivery counseling to their patients about feeding techniques and how to maintain lactation when the mother is separated from their infant. GEC discourages infants from receiving anything other than breastmilk unless medically indicated, including pacifiers or artificial nipples. Nursing staff should be encouraging breastfeeding on demand, and upon discharge mothers should be referred to breastfeeding support groups. Ultimately the facility should be complying with the International Code of Marketing of breast-milk substitutes (Baby-Friendly USA, 2022).

Problem Description

Internally collected data in the labor and delivery-postpartum unit has shown that breastfeeding initiation rates varies around 90% among the patient population served; however, the percentage drops significantly with the breastfeeding rate at discharge ranging from 76% to 83% at any given month. Considering that the average stay is 48-72 hours after birth, depending on the type of delivery, about 7-14% of breastfeeding mothers either stop breastfeeding or their discharge plan includes supplementation of some sort (pasteurized human donor milk or formula).

In 2017, the United States national breastfeeding initiation rates were 84.1%; exclusive breastfeeding rates at 3 months were 46.9% and at 6 months were 25.6%; while at the state level, the rates are higher at 88.3%, 63.0%, and 36.7% respectively (Centers for Disease Control and

Prevention, 2021). While our state is well above national statistics, this is still below the target of 42.4% set by Healthy People 2030 for exclusive breastfeeding rates at 6 months (Office of Disease Prevention and Health Promotion, n.d.).

Since 2010, the labor-delivery and postpartum unit has been a designated Baby-Friendly birth facility and supports key clinical practices like rooming-in for the entire hospital stay, breastfeeding support and education to mothers, and offering uninterrupted skin-to-skin the first hour immediately after birth. Skin-to-skin is conducive to unassisted breastfeeding initiation, among other benefits for the infant (Baby-Friendly USA, 2021). These requirements are part of the *Ten Steps to Successful Breastfeeding* and are the broad framework that guides the BFHI (World Health Organization, n.d.).

Recently, the labor and delivery-postpartum unit was under quinquennial review for their Baby-Friendly re-designation; Baby-Friendly USA's initial informal review underlined a possible concern in the predominant use of the bottle and artificial nipples for medically indicated supplementations in breastfed infants, which will likely require a quality improvement action by the unit to maintain the renowned designation (personal correspondence, April 2022).

Step 9 of Baby-Friendly USA's guidelines (see Appendix A) to not give pacifiers or artificial nipples to breastfed newborns has been recently revised to be less restrictive in its meaning; it now includes recommendations on counseling mothers about the use of bottles, artificial nipples, and pacifiers rather than forbidding their use completely (World Health Organization, 2018). It still suggests limiting the use of bottles and artificial nipples, mostly when supplementation is medically required for breastfed infants, and endorses to offer mothers alternative feeding methods, such as cup, spoon, syringe, pipette, or supplemental nursing systems (World Health Organization, 2018).

Available Knowledge

The literature review focuses on evaluating existing data on the impact of the use of bottles and artificial nipples on the establishment of exclusive breastfeeding and investigates any knowledge about alternative feeding methods such as cup feeding or other available mediums. The Academy of Breastfeeding Medicine (ABM) is a worldwide organization of medical doctors that have been providing evidence-based information with the aim to promote, protect, and support breastfeeding; their protocol about supplementation is appraised first as it is considered a clinical guideline that most professionals follow in their practice.

Supplementary Feedings in the Healthy Term Breastfed Neonate

Kellams et al. (2017) in their article *ABM Clinical Protocol #3: Supplementary Feedings in the Healthy Term Breastfed Neonate, Revised 2017* review in thorough details choice of supplement, methods of providing supplementary feedings to the neonate, recommendations, and volume of supplementation necessary for the healthy term breastfed newborn. Important information to mention is that weight loss in the newborn is part of the normal “physiologic diuresis of extracellular fluid following transition from intrauterine to extrauterine life and the passage of meconium” (Kellams et al., 2017, pg. 188)). Data collected in a prospective cohort study in a U.S. Baby-Friendly hospital show that the mean weight loss of exclusively breastfed newborns was 5.5%; additionally, of important note, more than 20% of healthy term breastfed neonates lost more than 7% of their birthweight, and those infants born by cesarean section have shown a greater weight loss than those born by vaginal birth. Often, in hospital births, excess weight loss can have a direct correlation to the intravenous fluids received by the mother during the laboring and birthing process; however, it is not indicative of breastfeeding success or failure. At times, supplementation may be indicated for the breastfed infant, these instances can be

hypoglycemia, inadequate milk intake leading to dehydration, excessive weight loss in the range of $\geq 8-10\%$, delayed bowel movements, hyperbilirubinemia, maternal insufficient glandular tissue (IGT), breast pathology or prior surgery, and incompatible medications with breastfeeding. As indicated in this ABM protocol, “all supplemental feedings should be documented, including the content, volume, method, and medical indication or reason” (Kellams et al., 2017, pg. 190). Specifically of interest are methods of providing supplementary feedings when medically indicated. ABM mentions that currently there is no optimal supplemental feeding method as they all carry potential risk or benefit. However, according to some evidence, artificial nipples should be avoided if the intention of the mother is to return to exclusive breastfeeding. Cup feeding seems to be one of the safest feeding methods when supplementing, as well as allowing to preserve controlled feeding pace and therefore preservation of exclusive breastfeeding. Other mentioned methods include supplemental nursing systems (SNS) at the breast, spoon or pipette, finger-feeding, and syringe feeding. It is important to evaluate which method is the most appropriate for the dyad as it may vary on a case-to-case basis; some factors to consider could be cost and availability, cleaning, ease of use, ability to deliver adequate volume in 20-30 minutes, and maternal preference. When bottle feeding is chosen, paced bottle feeding should be taught to avoid fast flow and unnecessary higher volumes. This article is a clinical practice guideline, therefore rated at a level I of evidence. Written with the collaboration of the Academy of Breastfeeding Medicine (ABM), it is considered the golden standard of the breastfeeding guidelines and is followed as one of the best resources by many healthcare providers.

According to ABM, more research on each individual feeding methods should be conducted, as well as determining what the optimal and appropriate volume for supplementation is depending on the specific condition we are trying to treat, and whether there is a difference in

volume needed if we are supplementing colostrum or infant formula. Since 1993 the Academy of Breastfeeding Medicine has been building a global community composed of medical doctors from different backgrounds and specialties to create guidelines that can help healthcare providers across the world on topics related to infant feeding and breastfeeding; their protocols are highly regarded in the health industry and are often used as a foundation to select certain interventions (Stevens, n.d.).

Cup Feeding as Alternative Method

Penny et al. (2018) in their article *Cup Feeding as a Supplemental, Alternative Feeding Method for Preterm Breastfed Infants: An Integrative Review* reviewed 12 studies with the aim to summarize and analyze research related to the safety and efficacy of cup feeding as a feeding alternative, as well as tracking breastfeeding outcomes. The results gathered for this review were that those infants who were given cup feedings had a more stable heart rate and oxygen saturation than those who were given bottles. In addition, breastfeeding rates for those newborns who were given cup feedings were higher at time of discharge and continued to stay higher at 3- and 6-months post-discharge. Interestingly, this review shows that cup feeding does not require longer time than bottle feeding; this sounds like a good talking point for those nurses who may be worried about the added time required to feed preterm newborns. Another factor relevant to this specific review is that cup feeding is recommended for late preterm infants, from 35 weeks gestational age.

This article is rated a level 1 of evidence and is an integrative review. The sample sizes of the 12 articles selected ranged from 8 to 522 infants, and they were all preterm ranging from 24 to 37 weeks' gestation. Limitations for this review are the inconsistency of the cup feeding

technique and protocols used; specific protocol descriptions would allow for an easier direct comparison across studies.

Artificial Nipples and their Impact to Exclusive Breastfeeding

Cavalcante et al. (2021) in their article *Consequences of Using Artificial Nipples in Exclusive Breastfeeding: An Integrative Review* analyzed 38 articles that brought to the conclusion that the use of artificial nipples is associated with increased breastfeeding interruption, and the mothers' education level was reflected in an increase of exclusive breastfeeding rates. Artificial nipples were identified as pacifiers, bottles, and nipple shields. Mostly, the consequences of using artificial nipples were associated with the newborn refusing to breastfeed, early weaning, impaired suction, incorrect latch, orofacial development interference, and interruption of exclusive breastfeeding (Cavalcante et al., 2021). Particularly, interference between bottle feeding and breastfeeding is due to the difference in the flow of milk from the breast and that from the bottle, indicating a preference for the faster flow of the bottle (Cavalcante et al., 2021). Additionally, mothers who used artificial nipples were found to have experienced "pain, nipple fissures, frustration, and reduced interaction with their infants" (Cavalcante et al., 2021, pg. 1).

This article is rated a level 1 of evidence and is an integrative review that analyzed 38 articles; most were level 4, two articles were level 2. In addition, most articles were about pacifiers, some both pacifiers and bottles, a few about nipple shields.

Pacifier/Bottle Feeding vs. Cupfeeding

Howard et al. (2003) in their article *Randomized Clinical Trial of Pacifier Use and Bottle-Feeding or Cupfeeding and Their Effect on Breastfeeding* aim to evaluate if the use of artificial nipples and bottle feeding exert any effect on breastfeeding and compare cup feeding

versus bottle feeding. The sample size of 700 mother-infants dyad were divided in 4 groups: 1) bottle/early pacifier, 2) bottle/late pacifier, 3) cup/early pacifier, and 4) cup/late pacifier. This study failed to demonstrate whether cup feeding as a method of supplementation improved the likelihood of exclusive breastfeeding at discharge or longer term. Cup feeding was found to significantly improve the duration of breastfeeding for those mothers who delivered by cesarean, particularly when multiple supplemental feedings were medically recommended (Howard et al., 2003).

One limitation of this article compared to the other ones reviewed in this appraisal is that the collection of data from the trial took place in 1998 and therefore, it does not include newer research and data; additionally, most of the population in the trial was white and well-educated married women. However, being a randomized clinical trial, it still holds good credibility and validity.

It is considered a level 2 of evidence and is a quantitative study. It is particularly focused on the early use of pacifier and its detrimental effect to exclusive breastfeeding, which has been proved in the more recent years and recommendations are to wait at least 4 weeks before introducing pacifier so that breastfeeding is more likely to be established (Howard et al., 2003). Even though this study did not demonstrate if cup feeding had a positive effect on the continuation of breastfeeding, it still was found to be the preferred way to supplement feedings to breastfed infants (Howard et al., 2003).

Appraisal Synthesis

Overall, the articles presented in this literature review are strongly supporting the thesis statement that bottles and artificial nipples are often detrimental to the establishment and continuation of exclusive breastfeeding when used for supplementation to both preterm and full-

term infants. Stronger research is still needed to prove which alternative feeding methods are considered the least invasive to the breastfeeding dyad and cause the least amount of interference to exclusivity of breastfeeding. The research supports a preference for cup feeding among all other alternative methods, which can be an effective method when appropriate training is provided to staff and patients. Currently, as evidenced by the ABM protocols, other methods are still to be considered for use when supplementation is needed, and each individual breastfeeding dyad should be evaluated carefully when a choice is to be made.

With this presented evidence, the QI project focused on following the ABM protocols and the Baby-Friendly guidelines to minimize the use of bottles and artificial nipples whenever supplementation was needed to address a medical concern. In the eventuality a physician recommended an additional nutritive intake, nursing staff would offer alternative feeding methods to the breastfeeding dyads. The overall goal of the QI project was to reduce the interference that bottles and artificial nipples can cause to the exclusive breastfeeding establishment and provide the necessary education to parents to allow informed choice.

Rationale

Maintaining the Baby Friendly credentials requires the hospital to follow the same guidelines and evaluation criteria set by The Baby-Friendly Hospital Initiative (Baby-Friendly USA, Inc., 2022). Particularly, step 9 in the *Ten Steps for Successful Breastfeeding* mentions that mothers should be educated about the interference bottles and artificial nipples can cause to their breastfeeding journey and counseled about any medically needed supplementation being given with other feeding means, such as tube, syringe, spoon, or cup instead of a bottle with an artificial nipple.

The Plan-Do-Study-Act (PDSA) framework was utilized to guide this quality improvement project. The PDSA is often used as a fast method to test change: with four continuous steps that can be repeated, it allows for a way to test ideas, learn from them, and progress to newer and better ideas based on previous cycles with the final goal of making improvements (Nelson et al., 2007). In the *plan* phase, an assessment of the current state was completed to evaluate how prevalent the use of the bottle and artificial nipples is in the microsystem when supplementing full-term breastfed infants. In the *do* phase, nurses were introduced to the QI project and educational tools about bottle, artificial nipples, and alternative feeding methods in the form of posters which will be affixed in common areas accessible by nursing staff. The focus of this QI project was for the nurses to actively offer alternative feeding methods whenever a supplementation was medically indicated for full-term breastfed infants and deliver education to parents about the possible impact bottles and artificial nipples may cause to exclusive breastfeeding. During the *study* and *act* phases, data was compared pre- and post-intervention and further actions required were reviewed and implemented for subsequent PDSA cycles.

Specific Aim

The specific aim of this QI project is to reduce the use of bottles and artificial nipples in full-term breastfed infants who require a medically necessary supplementation, whether it is Pasteurized Donor Human Milk (PDHM) or formula, by 15% by July 1, 2022.

As evidenced by the Baby-Friendly USA informal report in April 2022, the nursing staff was resorting to the use of bottles and artificial nipples with great ease before attempting other feeding methods mentioned above and were not delivering the necessary education to the breastfeeding mothers on the use of bottles and artificial nipples. The global aim of this QI

project is to increase the number of dyads who establish a greater supply upon discharge and are more likely to successfully continue breastfeeding.

Methods

Context

This QI project was implemented in the 20-bed labor and delivery-postpartum unit, located within a 295-bed, level-II trauma center hospital in south-central New Hampshire. This unit serves communities located in the surrounding areas within the region and some must travel from further north. Additionally, the unit has three triage rooms on the same unit where patients seeking emergent assessments, scheduled induction and cesarean section patients are initially assessed and eventually admitted to the unit if needed (internally collected data, 2022). Any pregnant patient who is 20 weeks of gestational age presenting to the Emergency Room (ER) will be transferred to the labor-delivery unit for further evaluation, regardless of the complaint the patient is expressing (internally collected data, 2022).

Cost-Benefit Analysis

The implementation of this QI project may not see immediate cost-benefits, but in the longer term, an increased number of breastfed infants would translate in less medical expenses for children under the age of 1. As shown by Ball and Wright (1999), exclusively formula-fed children under the age of 1 were more likely to present to the medical community with lower respiratory illnesses, otitis media, and gastrointestinal episodes.

Direct costs of this QI project would include 4-6 colored-printed posters to be affixed in locations such as staff and conference rooms, and locker rooms, for an estimated total of \$0.48; cost of cup feeding tool, average per patient \$3.30 for two cups, cost of disposable calibrated pipettes would be \$0.48 averaging 6 pipettes per patient, cost of disposable supplemental nursing

system (SNS) would average around \$48 considering 2 kits being used per couplet. With a reduction in the use of bottles and artificial nipples, the hospital could save about \$12.50 per couplet considering 2 bottles were used during their stay.

For patients, the benefits related to the implementation of this QI project are increased likelihood to establish exclusive breastfeeding, savings associated to the purchase of formula (estimated around \$1,200 per year per infant), as well as all the health benefits connected with breastfeeding exclusively for a minimum of 6 months as recommended by WHO as well as the AAP (Eidelman et al., 2012).

Interventions

An informative poster for nursing staff was prepared to include interferences caused by bottles and artificial nipples, and benefits of alternative feeding methods available for breastfeeding couplets supplementing their infants. The posters were affixed in commonly utilized rooms, such as staff room, locker room, conference room, and staff bathrooms, where most nurses are likely to go multiple times during their shift. The educational refresher included recommendations to offer alternative methods such as cup, spoon, pipette, or supplemental nursing system as determined by the registered nurse in charge of the breastfeeding couplets and or by the lactation consultant whenever a medically needed supplementation is required for a full-term infant (excessive weight loss, hypoglycemia, hyperbilirubinemia, etc.). Whenever a parent is requesting the use of a bottle and artificial nipples over alternative methods, educational information about possible interferences to the initiation of exclusive breastfeeding is delivered prior to the use of such tools. Alternative feeding tools are already in possession of the hospital; however, they were made more readily available to the nursing staff, by creating an alternative feeding tool station in the nursery and in the milk depot room. The implementation of this QI

project was performed with full-term breastfed newborns; the word full-term includes all those infants who are born at 37 weeks of gestation or older.

Stakeholders in this intervention included the nursing staff, the clinical nurse leader, the nurse manager of the unit, and lactation consultant staff including the lactation coordinator. The intervention idea was introduced to the clinical nurse leader, the nurse manager, and the lactation coordinator and staff and it was well received, indicating stakeholder support.

Study of the Intervention

Prior to the initiation of the intervention the lactation coordinator and data analyst provided a list of breastfeeding couplets who supplemented, as medically indicated, during their stay at the hospital; a random selection of 40 charts was audited, the *feeding methods* under *newborn feeding in interactive view* in *Cerner™* was noted and transcribed in an excel table, this data was de-identified and at no time was PHI shared.

Thirty days after the educational intervention, the data analyst provided a new list of breastfeeding couplets who supplemented for medical indication during their stay after the implementation of the QI intervention. A new chart audit of 17 random patients from this list was reviewed and the feeding methods used were noted and transcribed in the same excel table, ready for a comparable analysis.

Measures

The data gathered from the audit of 40 pre-intervention and 40 post-intervention charts among those breastfeeding dyads who had been recommended by a physician to initiate supplementation for medical reasons, was collected and transcribed in an excel table. Each patient was given a numerical identification, such as “Infant 1”, from 0-80 on the sole purpose of

counting the participation to the study. Protected Health Information (PHI), other than the feeding method utilized, were not collected at any time.

Analysis

Descriptive statistical analysis of the categorical data, including frequency and percentage of, were compared to determine whether there was an increase or decrease in the use of bottles and artificial nipples pre-and post-intervention. A chart comparison was graphed for ease of comparison, displaying percentages of each feeding method for pre- and post-intervention period. Different colors representing both periods were used to facilitate readability and comparability.

Ethical Considerations

Prior to the beginning of the implementation, the Privacy and Security Committee of the organization approved the audit of a total of 80 charts pre- and post-intervention with the sole purpose to collect de-identified data specific to the feeding method utilized to provide medically needed supplementation to full-term breastfed infants. The collected data during this QI project was de-identified and at no time was PHI shared. The UNH Department of Nursing Quality Committee reviewed this proposal and determined that it met the criteria for a quality improvement project that was exempt from IRB review.

For transparency reasons, I affirm that I am currently employed as a lactation consultant in the same organization; however, I accessed the EHR using my student account. No other ethical concerns were identified, nor competing interests.

Results

Results

Educational posters were prepared and posted as planned in common areas where nursing staff is likely to gather or walk by daily; they were made in such way to catch attention and encourage reading (see Appendix B). The content had been carefully selected based on evidence-based research on the interference of the use of bottles in breastfed infants in relation to breastfeeding establishment. An email explaining the project and the goal was sent to the Clinical Nurse Leader of the unit and forwarded to all the nursing staff of the labor and delivery, and postpartum unit asking for their collaboration. The implementation of this Quality Improvement project is directly related to the newest revised Baby-Friendly USA guidelines and participation of the staff will be indicative of full compliance to such guidelines. The posters invited all the nursing staff to educate breastfeeding dyads who require supplementation for medical necessity about interferences that bottles, and artificial nipples may cause. According to Baby-Friendly USA guidelines it is required to perform patient education and document it in the infant's chart at the first instance.

The data gathered from the 40 chart audits pre-intervention (see Table 1) showed that 25 infants (62.5%) used a bottle as a first feeding method to receive medically needed supplementation. The remaining 15 were offered alternative feeding methods, with a prevalence of pipette use (N = 11, 27.5%) followed by spoon (N = 3, 7.5%), SNS (N = 1, 2.5%), and cup (N = 0, 0%).

A total of 17 charts (see Table 1) were audited post-implementation and the results showed that 9 breastfeeding dyads (53%) used a bottle and artificial nipple on their first medically needed supplementation. 8 couplets (47%) used alternative feeding methods, of which

6 (35%) used a pipette, 1 (6%) a spoon, 1 (6%) a SNS, and 0 (0%) used a cup. One of these couplets who used a bottle were given education about the possible interferences to breastfeeding with its use and was documented in the infant chart.

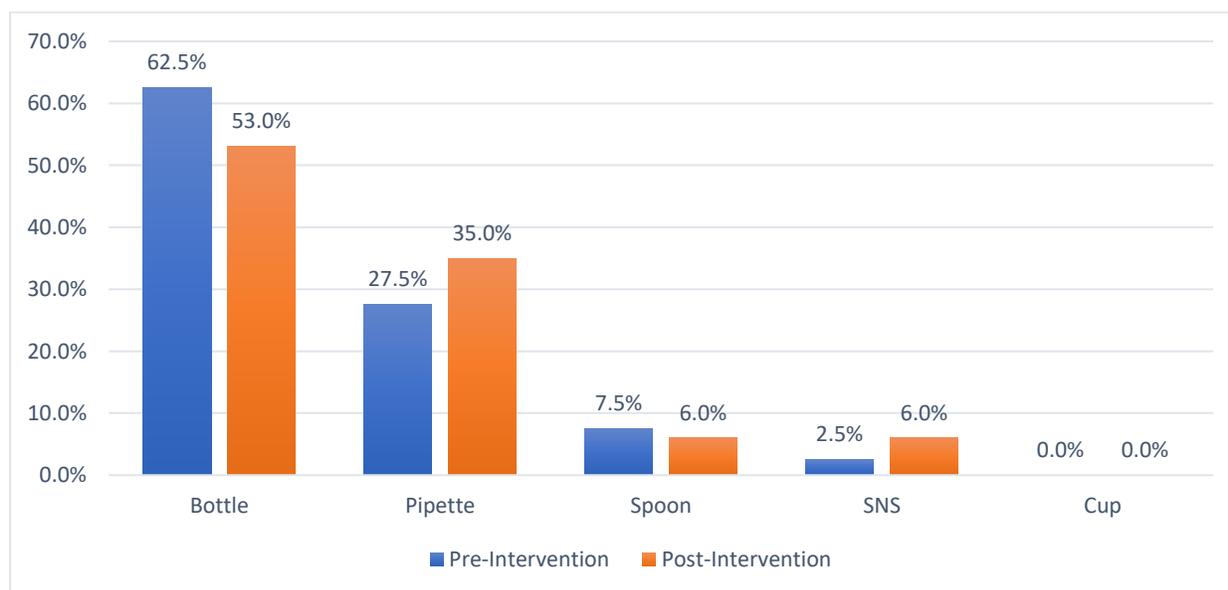
Table 1

Feeding Methods (Pre- and Post-Intervention) Data

Feeding Methods	Pre-Intervention		Post-Intervention	
	N	%	N	%
Bottle	25	62.5 %	9	53 %
Pipette	11	27.5 %	6	35 %
Spoon	3	7.5 %	1	6 %
SNS	1	2.5 %	1	6 %
Cup	0	0 %	0	0 %

Figure 1

Pre/Post-Intervention Chart Comparison



Some delays were experienced in the starting time of the implementation as originally planned, due to vacation of managerial staff and unexpected sick time of staff indirectly involved in the approval of the QI project. Additionally, post-intervention chart audits were not accessible until the Data Analyst had processed the whole month of June 2022, which was completed within the first few days of July 2022. As soon as the month of June 2022 was accessible for audits, the data was retrieved and available for descriptive statistical analysis of the categorical data, including frequency and percentage of, and a comparison between the pre- and post-intervention data to determine whether there was an increase or decrease in the use of bottles and artificial nipples in the unit during the period analyzed (June 20 – 30, 2022).

Discussion

Summary

Key Findings

By comparing the post- and pre-implementation results, as presented in Figure 1, a decrease of 9.5% in the use of bottles and artificial nipples was seen during the post-intervention period, with an overall percentage of 53% compared to the previous 62.5%. The specific aim set for this QI project to reduce the use of bottles and artificial nipples in full-term breastfed infants who require a medically necessary supplementation by 15% by July 1, 2022 was not fully achieved. However, an increased use of alternative feeding methods (pipette, spoon, SNS, cup) by a total of 9.5% compared to the pre-intervention period was observed. The results considered healthy full-term infants only, any newborn less than 36 weeks and 6 days gestational age at birth was not included in the data collected for this QI project. Nursing staff may have implemented the recommendations on late preterm infants at their own clinical discretion based on the ability of the newborn. During this rapid cycle change, the necessity of implementing

some additional features to the EMR was raised to accommodate some of the Baby-Friendly USA guidelines; particularly, an additional entry reflecting the requirement to document that education regarding bottles and artificial nipples was delivered to the parents will be suggested to the IT department for consideration.

Project Strengths

This QI project was fully supported by the managerial staff of the unit, as well as by most of the nursing staff; a few nurses informally expressed their gratitude for the educational posters. The Privacy and Security Committee of the organization had also given their approval for the QI project to be implemented as seen beneficial not only for the unit, but also for the hospital, as it would support alignment with the Baby-Friendly USA guidelines. Additionally, this QI project indirectly increased the opportunity for patients to take an informed choice when presented with several options on how to feed supplementation to their infant, increasing their education and be an active participant to the medical decisions on their infants.

Interpretation

The purpose of the educational posters (see Appendix B) was to function both as a refresher and provide an update on Step 9 of the Baby-Friendly Guidelines (see Appendix A) to all the nursing staff. The required implementation necessary to align with the current guidelines was outlined in the posters and nurses were asked to offer alternative feeding methods, counsel, and educate mothers on the possible interferences the use of bottles and artificial nipples to exclusive breastfeeding, and document that the education was delivered whenever the mother decide to use a bottle.

The results obtained with the QI project show that the education provided to the nursing staff had a positive impact, even though the specific aim was not achieved. An increase in

alternative feeding methods increased, particularly in favor of the pipette. The specific aim (SA) may have not been met for several reasons, including short implementation period, education not yet read, lack of interest of some nursing staff, to name a few. No other metrics that could give an explanation as to why the SA was not met were not gathered in this rapid cycle change.

A need to implement the functionality of the EMR documentation to include the ability to chart the education about bottles was delivered to the parents has been determined during the implementation of this QI project. Currently the EMR is lacking a specific section for this relevant requirement set by Baby-Friendly USA guidelines, therefore its addition would most likely enable a higher compliance and act as a reminder for the nurses when documenting.

Impact

The QI project was well received by most of the nursing and managerial staff, several nurses have expressed verbally their gratitude for the initiative and showed a positive outlook towards the project. The unit lactation coordinator, who oversees the BFHI designation, expressed an interest in continuing the implementation initiated with this rapid cycle change.

Contextual Factors impacting the Specific Aim

A possible reason the specific aim was not achieved in this QI project is potentially due to a lower number of charts audited after the intervention. The goal was to review 40 charts pre- and post-implementation, but due to time constraints only 17 charts that fitted the set criteria were selected in the post-period and this may have perhaps impacted positively or negatively the results.

Costs and Strategic Trade-Offs, including Opportunity Costs

Considering the 7.5% increase in the use of pipettes in the post-intervention period, about \$3.60 were spent additionally compared to the pre-intervention period, whereas by using 9.5%

less in bottles and artificial nipples the organization saved roughly \$120. The impact in savings is quite notable especially when recognizing the pilot had a small number of participants. However, in light of the long-term savings that exclusive breastfeeding could have on a larger scale by preventing some acute and chronic illnesses in the future population, similar QI implementations aimed at increasing breastfeeding should continue to be supported and implemented.

Limitations

More notable results may have been obtained with a larger pool of charts reviewed, as well as a longer period post-intervention. The initial goal was to review an equal number of charts on both sessions analyzed, 40 Electronic Health Records (EHR) per session were approved by the unit CNL and the Privacy and Security Committee; however, due to time constraints only 10 days were available for evaluation and 17 charts were deemed to meet the set criteria in this QI project among an overall 23 dyads who received a medically necessary supplementation.

Despite the educational posters were placed in visible and common areas frequented often by nurses, the possibility that some of the nursing staff may have not had an opportunity to read them is quite high. An alternative approach to deliver the education component related to the QI project could have included small group meetings with the nurses, which may have created the opportunity of collecting verbal feedback. Additionally, had there been more time to deliver the education part of the implementation process, there could have been control over the number of nurses who had received and completed the refresher and results may have been of more influential value for the aim of the QI project.

This QI project could be used as a guide in a similar microsystem which is currently willing to improve their supplementation feeding methods in their post-partum unit, whether the

organization is Baby-Friendly designated or in the process of designation. In an organization that is approaching the Baby-Friendly guidelines, the implementation could be included within the breastfeeding education required for all nursing staff.

Conclusions

The implementation started with this QI project is to be continued as the increase of using alternative feeding methods instead of bottles would be beneficial in the long term to breastfeeding establishment. It may also positively impact the rates of exclusive breastfeeding at 3 and 6 months of age of the infant, although this would require more accurate and detailed research studies. The recommendation to educate mothers about the possible consequences of an early use of bottles and artificial nipples, not only is required to be compliant with Baby-Friendly guidelines, but it also supports the patients' right to informed choice. For any medical intervention, the patient has the right to gain full comprehension and understanding about the reason and possible alternatives available, likewise a parent should have the same right about infant feeding. Therefore, healthcare providers should educate parents about the feeding methods at their disposal whenever a supplementation is medically recommended for their infant, as well as making them aware of the possible interferences to breastfeeding a bottle could cause. According to Goldberg (2009), patient's involvement in informed decision making about their infant carries many benefits, including a higher sense of responsibility for theirs and their infant's health, a stronger emotional well-being, empowerment, and self-esteem. The mother's perception can consequently impact positively their infant's short- and long-term health and development (Goldberg, 2009).

As previously mentioned, it was found that the EMR is lacking the ability to document that education about possible interferences of bottles and artificial nipples was given to the

parents. Therefore, a suggestion will be communicated to the unit CNL to initiate a collaboration with the organization's IT department and to make this available going forward. The option of this added functionality embedded in the EMR would most likely increase documentation by the nursing staff and act as a reminder of the practice. Overall, the increased use of alternative methods observed during this rapid cycle change led us to the assumption that more dyads were discharged with a larger likelihood of the establishment of a greater supply and the continuation of exclusive breastfeeding.

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Appendix A

Step 9: Give no pacifiers or artificial nipples to breastfeeding infants

Step 9 of the guidelines and evaluation criteria set by Baby-Friendly USA has been recently reviewed to clarify its interpretation and be less restrictive against the use of bottles, artificial nipples, and pacifiers:

Counsel mothers on the use and risks of feeding bottles, teats [artificial nipples] and pacifiers.

9.1 Guideline: Health care professionals, including nursery staff, should educate all breastfeeding mothers about how the use of bottles and artificial nipples may interfere with the development of optimal breastfeeding. When a mother requests that her breastfeeding infant be given a bottle, the health care staff should engage in a conversation about the reasons for this request, address the concerns raised, educate her on the possible consequences to the success of breastfeeding, and discuss alternative methods for soothing and feeding her infant.

If the mother still requests a bottle, the process of counseling and education and the informed decision of the mother should be documented.

Any fluid supplementation (whether medically indicated or following informed decision of the mother) should be given by tube, syringe, spoon, or cup in preference to an artificial nipple or bottle.

9.1.1 Criterion for evaluation: At least 80% of breastfeeding mothers that are unable to feed their baby directly at the breast or needed/chose additional supplementation will report:

A. Alternative feeding methods were offered and,

B. If requesting bottles, mothers can describe one possible impact that bottles and artificial nipples might have on breastfeeding.

9.1.2 Criterion for evaluation: The nursing director/manager will confirm that breastfed infants are not routinely given bottles.

9.2 Guideline: Health care professionals, including nursery staff, should educate all breastfeeding mothers about how the use of pacifiers may interfere with the development of optimal breastfeeding. Breastfeeding infants should not be given pacifiers by the staff of the facility, with the exception of limited use to decrease pain during procedures when the infant cannot safely be held or breastfed (pacifiers used should be discarded after these procedures), by infants who are being tube-fed in NICU, or for other rare, specific medical reasons.

When a mother requests that her breastfeeding infant be given a pacifier, the health care staff should engage in a conversation with her about the reasons for this request, address the concerns raised, educate her on the possible consequences to the success of breastfeeding, help with any breastfeeding problems, discuss alternative methods for soothing her infant and the appropriate time to introduce a pacifier, once breastfeeding is well established.

If the breastfeeding mother still requests a pacifier, the process of counseling and education and informed decision should be documented. (Baby-Friendly USA, 2022, pp. 21-22).

Appendix B

Educational Posters

Bottles and Artificial Nipples ...

1

May Create **Nipple Confusion** / Preference

2

Use **Different Sucking** Action: Tongue used as a "Piston" VS. Undulatory Movements at Breast

3

May Teach a **Shallow Latch** at the Breast

4

Interferes negatively with **orofacial development**

5

May Promote a **Faster Flow:** leading to unnecessary higher volumes fed to the Infant

6

Infant May **Refuse** the **Breast**



BABY-FRIENDLY USA

ENCOURAGES OFFERING ALTERNATIVE FEEDING METHODS (CUP, SPOON, PIPETTE, SNS, SYRINGE) FOR MEDICALLY NEEDED SUPPLEMENTATIONS IN BREASTFED NEWBORNS

Your Current Practice Should Align with Baby- Friendly:

- **COUNSEL** MOTHERS ABOUT THE USE OF BOTTLES AND ARTIFICIAL NIPPLES, INCLUDING INTERFERENCES THEY MAY CAUSE TO EXCLUSIVE BREASTFEEDING ESTABLISHMENT
- OFFER **ALTERNATIVE FEEDING METHODS**, LIKE CUP, SPOON, PIPETTE, SNS, SYRINGE, WHEN FEEDING MEDICALLY NEEDED SUPPLEMENTATIONS
- CONSIDER THE AMOUNT OF SUPPLEMENT TO BE ADMINISTERED AND CHOOSE APPROPRIATE FEEDING METHOD
- IF THE MOTHER STILL PREFERS TO USE THE BOTTLE, **DOCUMENT** IN THE **INFANT CHART** THAT EDUCATION ABOUT BOTTLE USE HAS BEEN GIVEN AT FIRST OCCURRENCE